IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:	
Ephraim GUTMARK *et al.*	Art Unit: 3749
Application No.: **10/725,562**	Examiner: Basichas, Alfred
Filing Date: 3 December 2003	Attorney Ref. No.: 003-102
For: Method for Affecting Thermoacoustic Oscillations in Combustion Systems	**Via EFS-Web**

BRIEF FOR APPELLANT

Mail Stop APPEAL BRIEF - PATENTS
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

COMES NOW APPELLANT to present this Brief in support of the appeal of the second rejection of Claims 1-8 and 16 in the above-captioned patent application. The Notice of Appeal having been timely filed on 7 March 2007, this Brief is due to be filed on 7 July 2007, with a Petition for a two-month extension of time. 37 C.F.R. §§ 1.7(a), 41.37 (a)(1), (e).

It is not believed that extensions of time are required, beyond those that may otherwise be provided for in accompanying documents. If, however, additional extensions of time are necessary to prevent abandonment of this application or dismissal of this appeal, then such extensions of time are hereby petitioned under 37 C.F.R. § 1.136(a), and the Commissioner is hereby authorized to charge fees necessitated by this paper, and to credit all refunds and overpayments, to Deposit Account 50-2821.

For the following reasons, Appellant respectfully submits that the final rejection of each of Claims 1-8 and 16 in this application is in error, and therefore respectfully requests reversal of the rejections.

TABLE OF CONTENTS

I. REAL PARTY IN INTEREST

The real party in interest is ALSTOM Technology LTD, a corporation of Switzerland.

II. RELATED APPEALS AND INTERFERENCES

There are no appeals or interferences related to this appeal.

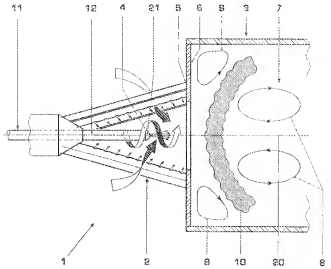
III. STATUS OF CLAIMS

Claims 1-8 and 16 stand twice rejected after the Office Action dated 10 October 2006. Claims 9-15 have been cancelled.

IV. STATUS OF AMENDMENTS

All amendments have been entered.

V. SUMMARY OF CLAIMED SUBJECT MATTER



This application describes and claims methods of affecting thermoacoustic oscillations in a combustion system [page 2, lines 10-13]. A copy of Fig. 1 of this application is reproduced herein to assist in a better understanding of the structures of an exemplary system that can be used in the claimed methods. The combustion system includes at least one burner 2 and at least one combustor 3 [Page 5, lines 12-18; Fig. 1]. The method includes modulating fuel injection into a recirculation zone 7 which forms in the combustor 3 [*passim*, *e.g.*: page 5, line 28 to page 6, line 3; page 7, lines 5-8].

In the method, in which the total quantity of fuel injection includes a first quantity and a second quantity, the method also includes injecting the first quantity of fuel at a constant rate and injecting the second quantity of fuel in a modulated manner [page 7, lines 20-29].

In the method, the second quantity of fuel can be smaller than the first quantity of fuel [page 6, lines 29-35 and page 7, lines 31-35].

In the method, the second quantity of fuel can be approximately between 6% and 1% of the total quantity of fuel [page 8, lines 1-5].

In the method, the modulating fuel injection can be performed independently of an oscillation phase of the thermoacoustic oscillations [page 8, lines 21-25].

In the method, the modulating fuel injection can be coupled to an oscillation phase of the thermoacoustic oscillations [page 10, line 35 through page 11, line 1].

In the method, the modulating fuel injection can be performed exclusively into the recirculation zone [page 4, lines 1-9; page 7, line 35 through page 8, line 1].

In the method, the injection of fuel into the recirculation zone can be performed exclusively in a modulated manner [page 4, lines 1-9; page 7, line 35 through page 8, line 1].

Additionally, this application describes and claims methods of affecting thermoacoustic oscillations in a combustion system [page 2, lines 10-13]. The method includes providing at least one burner 2, at least one combustor 3, and an abrupt widening 5, 6 of a flow cross-section between the at least one burner and the at least one combustor, the abrupt widening causing flow to form a recirculation zone 7, 9 in the at least one combustor [page 5, line 18-22]. The method also includes swirling flow 4 through the at least one burner [page 5, lines 12-16], and modulating fuel injection into the recirculation zone [*passim*, *e.g.*: page 5, line 28 to page 6, line 3; page 7, lines 5-8].

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

The Office Action includes four rejections:

(1) Claims 1-8, under a theory of provisional obviousness-type double patenting, over Claims 1-6 of Application No. 10/725,563;

(2) Claims 1-8, under a theory of provisional obviousness-type double patenting, over Claims 1-6 of Application No. 10/725,564;

(3) Claims 1-3, 5-8, and 16, under 35 U.S.C. § 102(b) over U.S. Patent No. 6,464,489, issued to Gutmark *et al.* ("Gutmark"); and

(4) Claim 4 under 35 U.S.C. § 103(a) over *Gutmark* alone.

According to the Interview Summary Record dated 13 April 2007, the Conferees to the Pre-Appeal Brief Conference have agreed to withdraw rejections (1) and (2) above; therefore, the grounds of rejection to be reviewed on this appeal are rejections (3) and (4) above.

VII. ARGUMENTS

A. Introduction

This application describes methods for changing thermoacoustic oscillations in combustion systems embodying principles of the present invention. In a combustion system having a combustor in which a recirculation zone is formed, injecting fuel into this recirculation zone in a modulated manner can have advantageous effects on these oscillations. Appellants have shown that, as a result of such modulated injections, suppression of the thermoacoustic oscillations can be considerably improved. As a result of injecting fuel into the recirculation zone, the vortex systems forming in the combustor and affecting one another can be intensely changed. Since the vortex systems present in the combustor are significantly involved in the production of thermoacoustic oscillations, thermoacoustic oscillations can be changed by way of specific, modulated fuel injection.

Because the subject matter of each of Claims 1, 2, 4, 5, 7, and 8 is separately patentable, each stands or falls separately. The remaining claims stand or fall with the claim from which each depends, and Claim 16 stands or falls with Claim 1.

To simplify consideration of the rejections of the various claims, the single prior art document relied upon in the Office Action will be discussed after a brief review of the law of anticipation under section 102 and of obviousness under section 103.

B. Legal Standards

Claim construction begins with the words of the claims. *Karlin Tech., Inc. v. Surgical Dynamics, Inc.*, 177 F.3d 968, 971 (Fed. Cir. 1999). Claim language should be interpreted as one reasonably skilled in the art would have interpreted the claim at the time of the patent application date. *Vivid Techs., Inc. v. American Science & Engineering, Inc.*, 200 F.3d 795, 804 (Fed. Cir. 1999); *Wiener v. NEC Elec., Inc.*, 102 F.3d 534, 539 (Fed. Cir. 1996). Where the

claim term has no specialized meaning to persons of skill in the art, the ordinary meaning of the words to those of ordinary skill in the art controls, unless the evidence indicates that the inventor used them differently. *Karlin*, 177 F.3d at 971. Such evidence includes the specification and prosecution history, both of which must be analyzed to determine if the inventor limited or redefined any of those terms. *Watts v. XL Sys., Inc.*, 232 F.3d 877, 882-84 (Fed. Cir. 2000); *Vivid Techs.*, 200 F.3d at 804. If claim language is not clear on its face, then intrinsic evidence also should be consulted to resolve the lack of clarity. *Interactive Gift Express, Inc. v. Compuserve, Inc.*, 256 F.3d 1323, 1331 (Fed. Cir. 2001).

Under the doctrine of anticipation, a patent claim is not patentable if the claimed invention lacks novelty. 35 U.S.C. § 102(b); *Karsten Mfg. Comp v. Cleveland Golf*, 242 F.3d 1376, 1383 (Fed. Cir. 2001). Anticipation, a question of fact, focuses on a comparison of the prior art to the subject matter of the claim at issue. *Celeritas Technologies, Ltd. v. Rockwell International Corp.* 150 F.3d 1354, 1361 (Fed. Cir. 1998). "[A] claim is anticipated if each and every limitation is found either expressly or inherently in a single prior art reference." *Celeritas*, 150 F.3d at 1361. A convenient way to consider anticipation is the "four corners" doctrine. The "four corners" doctrine refers to the idea that anticipation requires that each and every limitation of the claimed invention is described either expressly or inherently within the four corners of a single prior art document. *Advanced Display Systems, Inc. v. Kent State Univ.*, 212 F.3d 1272, 1282 (Fed. Cir. 2000).

A patent claim is invalid for obviousness if the differences between the claimed subject matter and the prior art are such that the claimed subjected matter as a whole would have been obvious at the time of the invention to a person of ordinary skill in the relevant art. 35 U.S.C. § 103(a). The determination of obviousness is a legal conclusion based on underlying factual considerations. *Graham v. John Deere Co. of Kansas City*, 383 U.S. 1, 17 (1966). These factual inquiries include: the scope and content of the prior art; the differences between the prior art and claims at issue; the level of ordinary skill in the pertinent art; and objective evidence of nonobviousness (*i.e.*, secondary considerations). *Graham*, 383 U.S. at 17; *KSR International Co. v. Teleflex Inc. et al.*, 550 U.S. ___, No. 04-1350, slip op. at 2 (April 30, 2007); *Brown &*

Williamson Tobacco Corp. v. Phillip Morris Inc., 229 F.3d 1120, 1124 (Fed. Cir. 2000); *DyStar Textilfarben GmbH & Co. Deutschland KG v. C. H. Patrick Co.*, 464 F.3d 1356 (Fed. Cir., 2006).

It is against this factual background that the ultimate determination of obviousness is made, *i.e.*, the claimed invention is obvious if the differences between it and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person of ordinary skill in the art. 35 U.S.C. § 103(a). "In line with th[e] statutory standard [of 35 U.S.C. §103], [the] case law provides '[t]hat consistent criterion for determination of obviousness is whether the prior art would have suggested to one of ordinary skill in the art that this process should be carried out and would have a reasonable likelihood of success, viewed in light of the prior art.' Two requirements are contained in this criterion." *Brown & Williamson Tobacco Corp.*, 229 F.3d at 1124 (*quoting In re Dow Chem.*, 837 F.2d 469, 473 (Fed. Cir. 1988)).

The U.S. Supreme Court very recently addressed the obviousness of a combination of known elements. Although a rigid application of the Court of Appeals for the Federal Circuit's "teaching, suggestion, or motivation" test was rejected, the Court stated that "a combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results." *KSR, slip op.* at 12. For example, the Court explained, when the prior art elements work together in an unexpected and fruitful manner, a finding of non-obviousness is supported. *Id.* (*citing United States v. Adams,* 383 U.S. 39, 40 (1966)). If, however, the combination of old elements does no more than they would in separate, sequential operation, even though the combination might perform a useful function, the combination is likely obvious. *Id.* at 13 (*citing Anderson's-Black Rock, Inc. v. Pavement Salvage Co.*, 396 U.S. 57 (1969)). Finally, the Court stated that "[i]f a person of ordinary skill can implement a predictable variation, §103 likely bars its patentability." *Id.* (*citing Sakraida v. AG Pro, Inc.*, 425 U.S. 273 (1976)). Nevertheless, the Court in *KSR* still required that there be a reason or purpose for modifying the prior art to arrive at the claimed invention, in order to find the claimed subject matter unpatentable under section 103(a). *Id.* at 14-15 ("Although common sense directs one to

look with care at a patent application that claims as innovation the combination of two known devices according to their established functions, it can be important to identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements in the way the claimed new invention does.").

Thus, while the Supreme Court in *KSR* ruled that the requirement, in the jurisprudence of the Court of Appeals for the Federal Circuit, for a "teaching, suggestion, or motivation" ("TSM" test) to make up for the deficiencies in the prior art to meet the claimed invention, cannot be rigidly applied, the Federal Circuit had already articulated that its test was flexible. *See, e.g., DyStar Textilfarben*, 464 F.3d at 1367 ("Our suggestion test is in actuality quite flexible and not only permits, but *requires*, consideration of common knowledge and common sense") (emphasis in original); *Alza Corp.* v. *Mylan Labs., Inc.*, 464 F.3d 1286, 1291 (Fed. Cir. 2006) ("There is flexibility in our obviousness jurisprudence because a motivation may be found *implicitly* in the prior art. We do not have a rigid test that requires an actual teaching to combine . . .".) (emphasis in original). It is therefore plain that *KSR* did not reject the TSM test, but only its application to the facts before the Court in that case, and it is thus still a requirement for a rejection under section 103 that there be some rational reason articulated by the PTO why a person of ordinary skill in the art would modify the prior art to arrive at the claimed invention.

C. Gutmark

Gutmark describes ways of controlling thermoacoustic vibrations in combustion systems which are simply different from those described and claimed in this application. Appellant has reproduced Figs. 1A and 8 of *Gutmark* to better assist in a full understanding of its disclosure.

Gutmark explains that the velocity profile 50 of the working gas in a combustor includes shear layers, including layers 51, that occur "in regions of changing flow velocities of one fluid flow or of several fluid flows abutting each other" (column 7, lines 62-63), and that exciting those shear layers influences the thermoacoustic vibrations in the combustion system (col. 1, lines 52-55). More specifically, *Gutmark* explains that introducing a small acoustic signal into the shear layer has a disproportionate effect on vibrations, because the excitations are amplified in the shear layers (col. 2, lines 33-34). *Gutmark* enumerates many locations in a combustion system where shear layers form, none of which are in a recirculation zone of the working gas.

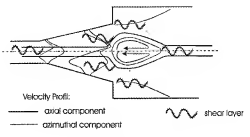


Fig. 1A of *Gutmark*

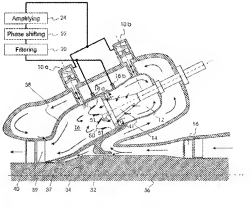


Fig. 8 of *Gutmark*

Gutmark proposes to introduce acoustic signals to have an effect on the thermoacoustic vibrations into the combustion chamber 16 (Fig. 6), into the air flow 12 upstream of the combustor (Fig. 7), and into both (Fig. 8). *Gutmark* contrasts its approach with the practice of introducing a phase-shifted acoustic signal ("anti-sound" or "noise cancellation": col. 3, lines 2-4) to attempt to cancel out the acoustic vibrations in the combustor. In *Gutmark*'s discussion at column 3, it merely mentions "fuel injection modulation" in the context of a comparison with inferior methods:

> Thus, for a 50% suppression in pressure fluctuation amplitude, the loudspeaker should supply a power of 75% of the acoustic power measured in the combustion chamber, if one would rely on anti-sound principles. Driving the loudspeakers at a power of P=100 W (Watts) and assuming a 10% efficiency of the loudspeaker, the power fed into the combustion chamber is only 0.6% of the suppressed power. As a further driving mechanism, flame and fluid flow dynamics in the combustion chamber, in particular thermoacoustic instabilities, can also be induced by changes in equivalence ratio.

> However, a comparison between the estimated OH change during one cycle of oscillation and the measured value showed that the driving mechanism which is initiated by the equivalence ratio (e.g. by fuel injection modulation) only plays a secondary role to the main mechanism related to flow instabilities.

To perform its method, *Gutmark* measures the acoustic vibrations in the combustor using sensors 18, 18a, 18b, processes that signal in a control loop (see Figs. 2-4), and drives an acoustic driver 10, e.g., one or more loudspeakers, to introduce pressure changes in the shear layers, and thereby inhibit the formation of coherent structures (col. 5, lines 35-63).

The only mention in *Gutmark* of recirculation zones appears in discussions of the locations of a shear layer (at "the outlet flow of the recirculation zone of the combustor" (col. 2, lines 28-29); "Areas of slow velocity are present adjacent the walls of the combustion chamber 16 and in the center of the chamber. The latter area of slow velocity results from the recirculating flow within the combustion chamber 16 which is required for flame stabilizing purposes."; (col. 7, lines 57-61)). Nowhere does *Gutmark* disclose or describe that modulating fuel injection is performed into a recirculation zone formed in a combustor.

D. The rejections of Claims 1-3, 5-8, and 16 over Gutmark under section 102 are in error

All of the rejections of pending claims under section 102 are in error, for at least the following reasons.

(i) Claims 1, 6, and 16 are patentable over *Gutmark*

Gutmark fails to identically disclose or describe the subject matters of Claims 1, 6, and 16. Claims 1 and 16 both relate to a method of affecting thermoacoustic oscillations in a combustion system, including modulating fuel injection into a recirculation zone which forms in the combustor.

A complete reading of *Gutmark* reveals that it is entirely concerned with using loudspeakers to acoustically drive shear layers in a combustor, to combat thermoacoustic oscillations. The two passages identified in the Office Action have nothing to do with the claimed subject matter: Col.3, lines 15-31 merely states that, in comparison to general modulated fuel injection, *Gutmark*'s method works better in affecting shear layers; and Col. 7, lines 50-63, only acknowledges that combustors of his type include recirculating flow, only to instruct the reader where shear layers are located. Nowhere does *Gutmark* describe the claimed step(s).

Despite this, during the recent telephonic interview, Mr. Basichas suggested that any injection of fuel into a combustor having recirculation zones would be read on by the claimed method, even though the Office Action is silent on this point. The undersigned pointed out a simple analogy (Mr. Basichas combatively indicated he was not interested in listening to analogies): 'If your office includes an open desk drawer, and if a person blows air into your office, do these two conditions necessarily mean that the person has blown air into your desk drawer?" The answer is clearly 'no', because there is no indication of any of the numerous and myriad details required to conclude, more likely than not, that the hypothetical air was blown into the hypothetical drawer. And, by simple analogy, there is no disclosure in *Gutmark* that his disclosure necessarily includes modulating fuel injection into a recirculation zone which forms in a combustor.

Gutmark only tangentially mentions modulated fuel injection, and only acknowledges the known fact that many combustors are operated to form recirculation zones, which function to stabilize the combustor's flame. Nowhere does *Gutmark* discuss, and nowhere does the Office Action allege with particularity, that *Gutmark* performs modulated fuel injection into any of the combustor's recirculation zones. Instead, it would appear that the Office Action, despite its silence on the point, has relied on an inherency theory to allege anticipation of certain claimed subject matter. Because the Office Action has failed to meet the minimum requirements of M.P.E.P. § 2112 in explaining how it is that *Gutmark* necessarily (*i.e.*, with 100% certainty) identically discloses the claimed subject matters, Appellant cannot point out the errors in the Office Action's analysis. Simple put, however, *Gutmark* discusses using loudspeakers to excite

shear layers in a combustor, which are physically different from recirculation zones, and merely uses the words "modulated fuel injection" and "recirculation" in the process of describing a very different invention.

(ii) Claims 2 and 3 are patentable over *Gutmark*

Gutmark fails to identically disclose or describe the subject matters of Claims 2 and 3. Claim 2 relates to a method of affecting thermoacoustic oscillations in a combustion system as stated in Claim 1, wherein the total quantity of fuel injection comprises a first quantity and a second quantity, and comprising injecting the first quantity of fuel at a constant rate, and injecting the second quantity of fuel in a modulated manner. Claim 3 depends from Claim 2.

Assuming, *arguendo*, that the subject matter of Claim 1 (from which Claim 2 depends) is anticipated by *Gutmark*, there is still no disclosure in *Gutmark* of how the injection of fuel into a recirculation zone is performed, and therefore no disclosure that any fuel injection described in *Gutmark* is subdivided into first and second quantities, with the first quantity being injected at a constant rate and the second quantity injected in a modulated manner. There is certainly nothing inherent in such a division of fuel quantities, and the paucity of *Gutmark*'s disclosure on this subject matter necessitates a finding that Claims 2 and 3 are both not anticipated by *Gutmark* and separately patentable from Claim 1.

(iii) Claim 5 is patentable over *Gutmark*

Gutmark fails to identically disclose or describe the subject matter of Claim 5. Claim 5 relates to a method of affecting thermoacoustic oscillations in a combustion system as stated in Claim 1, wherein said modulating fuel injection is performed independently of an oscillation phase of the thermoacoustic oscillations.

Assuming, *arguendo*, that the subject matter of Claim 1 (from which Claim 5 depends) is anticipated by *Gutmark*, there is still no disclosure in *Gutmark* of how the injection of fuel into a recirculation zone is performed, and therefore no disclosure that any fuel injection described in *Gutmark* is performed independently of an oscillation phase of the oscillations. Indeed,

Gutmark's method of driving an acoustic driver to influence shear layers indicates that the oscillation phase would be important to *Gutmark*, and there is certainly nothing inherent that any fuel injection modulation that *Gutmark* may describe would be performed independent of the oscillation phase of thermoacoustic oscillations in the combustor. The extremely limited nature of *Gutmark*'s disclosure on this subject matter necessitates a finding that Claim 5 is both not anticipated by *Gutmark* and separately patentable from Claim 1.

(iv) Claim 7 is patentable over *Gutmark*

Gutmark fails to identically disclose or describe the subject matter of Claim 7. Claim 7 relates to a method of affecting thermoacoustic oscillations in a combustion system as stated in Claim 1, wherein the modulating fuel injection is performed exclusively into the recirculation zone.

Assuming, *arguendo*, that the subject matter of Claim 1 (from which Claim 7 depends) is anticipated by *Gutmark*, there is still no disclosure in *Gutmark* of how the injection of fuel into a recirculation zone is performed, and therefore no disclosure that modulated injection is performed only into the recirculation zone. Because *Gutmark* does not actually describe modulated fuel injection into a recirculation zone, *Gutmark* cannot disclose or describe, even via a theory of inherency, that such injection is performed only into the recirculation zone. Because fuel injection into a double-cone burner, such as those used in *Gutmark*, can be made through a number of different locations, including tangential air slots and a center pilot port, and *Gutmark* does not describe delivering fuel through any of them in particularity, *Gutmark* does not inherently disclose the exclusive manner of modulated fuel injection required in Claim 7. Thus, Claim 7 is separately patentable from Claim 1.

(v) Claim 8 is patentable over *Gutmark*

Gutmark fails to identically disclose or describe the subject matter of Claim 8. Claim 8 relates to a method of affecting thermoacoustic oscillations in a combustion system as stated in

Claim 1, wherein the injection of fuel into the recirculation zone is performed exclusively in a modulated manner.

Assuming, *arguendo*, that the subject matter of Claim 1 (from which Claim 8 depends) is anticipated by *Gutmark*, there is still no disclosure in *Gutmark* of how the injection of fuel into a recirculation zone is performed, and therefore no disclosure that any fuel that may be injected into a recirculation zone is injected only in a modulated manner. Were *Gutmark* to describe the modulated injection of fuel into a recirculation zone in a combustor, there is no reason to believe that such injection is the only injection made into the recirculation zone; indeed, there could also just as simply be additional injection of fuel according to some other scheme. It would therefore be only speculation, and not the certainty required under section 102, that could indicate that *Gutmark*'s method includes only the modulated injection of fuel into a recirculation zone; plainly, speculation as to *Gutmark*'s disclosure does not suffice under section 102.

(vi) Conclusion

For at least the foregoing reasons, Appellant respectfully submits that the subject matters of Claims 1-3, 5-8, and 16 are not anticipated by *Gutmark*, and are therefore not unpatentable under 35 U.S.C. § 102.

E. The rejection of Claim 4 over Gutmark under section 103 is in error

Gutmark fails to identically disclose or describe the subject matter of Claim 4, and fails to fairly suggest its subject matter to a person of ordinary skill in the art. Claim 4 relates to a method of affecting thermoacoustic oscillations in a combustion system including as stated in Claim 2, wherein the second quantity of fuel is approximately between 6% and 1% of the total quantity of fuel.

The Office Action states, at page 5:

> Gutmark does not specifically recite,
>
> 4. The method as claimed in claim 2, wherein the second quantity of fuel is approximately between 6% and 1% of the total quantity of fuel.
>
> Nevertheless, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have incorporated the claimed range into the invention disclosed by Hermann [sic], since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable values or range involves only routine skill in the art. *In re Aller*, 105 USPQ 233; *In re Swain*, 156 F.2d 239.

Appellant first strongly disagrees with the (alleged) factual predicate upon which the foregoing rejection is based: that *Gutmark* discloses the general conditions of the subject matter of Claim 4. To the contrary, *Gutmark* fails to disclose modulating a fuel injection into a recirculation zone, instead describing using acoustic drivers to affect shear layers (which are not the same as recirculation zones), and therefore fails to describe the 'general conditions' of Claim 4.

Furthermore, even if *Gutmark* were somehow interpreted to describe the 'general conditions' mentioned in *In re Aller* and M.P.E.P. § 2144.05(II), the subject matter of Claim 4 is still patentable over both *Gutmark* and that of Claim 1, from which Claim 4 depends. M.P.E.P. § 2144.05(II) goes on to correctly instruct the examining corps:

> B. Only Result-Effective Variables Can Be Optimized
>
> A particular parameter must first be recognized as a result-effective variable, i.e., a variable which achieves a recognized result, before the determination of the optimum or workable ranges of said variable might be characterized as routine experimentation. *In re Antonie*, 559 F.2d 618, 195 USPQ 6 (CCPA 1977) (The claimed wastewater treatment device had a tank volume to contractor area of 0.12 gal./sq. ft. The prior art did not recognize that treatment capacity is a function of the tank volume to contractor ratio, and therefore the parameter optimized was not recognized in the art to be a result- effective variable.). See also *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980) (prior art suggested proportional balancing to achieve desired results in the formation of an alloy).

Once again, the Office Action failed to meet the bare minimums required for a *prima facie* case, under section 103 in this instance. Nowhere does the Office Action even allege that the amount

of the fuel modulation into a recirculation zone is a result-effective parameter, which omission is very simply explained: the prior art, including *Gutmark*, does not identify that the percentage of the total fuel used in the modulated fuel injection is important, and therefore is understandably silent. This failure of both the Office Action and the prior art are important, because Appellant has determined that very small percentages of the total fuel, such as those recited in Claim 4, can be used in the claimed fuel injection with beneficial effects. Nowhere does the prior art address the amount of such modulated fuel injection as being a parameter of any interest with respect to acoustic oscillations, and *Gutmark* fails to describe the general conditions of the claim. Thus, there is no rational reason (or teaching, suggestion, or motivation) to make up for the differences between either the method actually described in *Gutmark*, or that recited in Claim 1, to arrive at the combination of Claim 4.

For at least the foregoing reasons, Appellant respectfully submits that the subject matter of Claim 4, taken as a whole, would not have been obvious to a person of ordinary skill in the art at the time of Appellant's invention, and therefore not unpatentable under 35 U.S.C. § 103.

F. Claims 1-8 and 16 are patentable

For at least the reasons presented herein, each of the subject matters of Claims 1-8 and 16, each taken as a whole, is patentable over *Gutmark*. Accordingly, the rejection of each of Claims 1-8 and 16 under sections 102 and 103 is reversible error.

VIII. CONCLUSION

For at least the foregoing reasons, Appellant respectfully submits that the rejections of the claims in this patent application are in error, and therefore respectfully requests reversal thereof.

Respectfully submitted,

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Date: 5 July 2007

CLAIMS APPENDIX

1. A method of affecting thermoacoustic oscillations in a combustion system having at least one burner and at least one combustor, the method comprising:

modulating fuel injection into a recirculation zone which forms in the combustor.

2. The method as claimed in claim 1, wherein the total quantity of fuel injection comprises a first quantity and a second quantity, and comprising:

injecting the first quantity of fuel at a constant rate; and

injecting the second quantity of fuel in a modulated manner.

3. The method as claimed in claim 2, wherein the second quantity of fuel is smaller than the first quantity of fuel.

4. The method as claimed in claim 2, wherein the second quantity of fuel is approximately between 6% and 1% of the total quantity of fuel.

5. The method as claimed in Claim 1, wherein said modulating fuel injection is performed independently of an oscillation phase of the thermoacoustic oscillations.

6. The method as claimed in Claim 1, wherein said modulating fuel injection is coupled to an oscillation phase of the thermoacoustic oscillations.

7. The method as claimed in Claim 1, said modulating fuel injection is performed exclusively into the recirculation zone.

8. The method as claimed in Claim 1, wherein said injection of fuel into the recirculation zone is performed exclusively in a modulated manner.

16. A method of affecting thermoacoustic oscillations in a combustion system, the method comprising:

providing at least one burner, at least one combustor, and an abrupt widening of a flow cross-section between the at least one burner and the at least one combustor, the abrupt widening causing flow to form a recirculation zone in said at least one combustor;

swirling flow through the at least one burner; and

modulating fuel injection into the recirculation zone.

EVIDENCE APPENDIX

No additional evidence is cited in this Brief.

RELATED PROCEEDINGS APPENDIX

There are no proceedings related to this appeal.